Working Draft

Section 3.3 Approach to Conservation: Overview of Key Conservation Measures and their Integration

Note to Reviewers: *This handout provides proposed working draft text to section 3.3 "Approach to Conservation" from Chapter 3 "Conservation Strategy" of the BDCP document. The purpose of this section is to overview how the conservation measures would be integrated into an overall comprehensive BDCP conservation strategy. In Chapter 3 this section would follow an initial introduction and overview of the chapter and discussion of the plan's overall purpose, goals, and principles (section 3.1) and a section describing the specific biological goals and objectives for the BDCP (section 3.2). Section 3.3 would be followed by detailed descriptions of the specific conservation measures (section 3.4 "Conservation Measures") addressing water operations, habitat restoration, and other stressors; description of the Monitoring Program (section 3.5); description of the Adaptive Management Program (section 3.6); summary of the approach to minimization and mitigation of impacts (section 3.7); and summary of expected outcomes for covered natural community and covered species (section 3.8).*

3.3 Approach to Conservation: Overview of Key Conservation Measures and Their Integration

This section provides a summary description of the BDCP conservation strategy and how conservation measures would be integrated into a strategy to meet the multiple goals and objectives of the BDCP. A brief overview of the conservation strategy is first presented in section 3.3.1. *Overview of the Strategy*, including a summary of the primary components of the strategy – (1) construction and operation of north Delta diversion facilities and an isolated conveyance canal in conjunction with operation of existing facilities; (2) restoration of tidal marsh, floodplain, and riparian upland transition habitat; and (3) addressing non-conveyance and non-habitat-related stressors to covered species (collectively called "other stressors"). Following the overview discussion are descriptions of how various conservation measures would form integrated conservation actions within four broad geographical areas of the Delta (sections 3.3.2 to 3.3.5). The last section (section 3.3.6), describes conservation actions that would be applied across the Planning Area. Although conservation components are described relative to the particular geographical area where they would be wholly or primarily implemented, the beneficial effects of those components may be distributed to other parts of the Delta/Suisun Bay system and beyond. Given the ongoing increase in knowledge of Delta biological and physical processes, a robust monitoring program would provide the basis for an adaptive management program; these programs are describe in subsequent sections 3.5 and 3.6.

3.3.1: Overview of the Strategy

The major challenge for the BDCP conservation strategy is the restoration of key ecosystem functions in a highly altered and largely unnatural environment in the Delta. The Delta was once a vast marsh and floodplain dissected by meandering channels and sloughs that provided habitat for a rich diversity of fish, wildlife, and plants. The Delta of today is a system of artificially leveed and dredged waterways constructed into unnaturally static geometries designed to support farming and urban development on islands. Delta waterways provide transportation corridors for ships and boats, and convey water for urban and agricultural uses inside and outside of the Delta. The physical perturbations of the Delta, combined with multiple other environmental challenges to the ecosystem (including toxic discharges, invasions by many harmful non-native species, and habitat degradation) have contributed to declines in covered fish, wildlife, and plant species and other organisms.

To address these multiple environmental stressors on the Delta ecosystem, the BDCP conservation strategy was developed as a comprehensive integrated package of conservation measures that incorporate physical improvements (e.g., habitat restoration, fish passage improvements), improved ecosystem processes (e.g., changes in flow patterns, improved food web, enhanced habitat quality and availability), and direct enhancement of production and survival of covered species (e.g., mark-select fisheries, conservation hatcheries, and reductions of toxicants and non-native predators). This comprehensive, broad-based approach to addressing multiple stressors is essential to making significant contributions to the recovery of covered species and to the restoration of a naturally functioning ecosystem while securing a reliable freshwater source for human use.

An overall goal of the conservation strategy is to facilitate more flexible and ecologically beneficial management of the Delta. There are three primary components of the conservation strategy:

- Physical habitat restoration,
- Reduction in other stressors, and
- Improvements to water operations and flow.

Physical habitat restoration would include extensive restoration of tidal marsh, floodplain, and transitional upland habitat throughout the Delta and Suisun Marsh that is expected to enhance habitat and food productivity for covered species. Key habitat restoration actions, are described by geographic location in sections 3.3.2 through 3.3.5.

Other stressors conservation measures are actions that address stressors on covered species and natural communities other than the loss of habitat and water operations and flow. Other stressors include toxic contaminants, non-native predators and competitors, entrainment by diversions, and harvest. Implementation of conservation measures addressing other stressors is expected to reduce adverse effects on covered species. Other stressors conservation measures, are described by applicable geographic location in Sections 3.3.2 through 3.3.6.

Water operations conservation measures address the improvement of aquatic habitat in the Delta, in conjunction with meeting the BDCP planning goals for water supply and supply reliability, through the construction and operation of new facilities and the operation of existing facilities. The primary component in water operations is the construction and operation of new north Delta diversion facilities and an isolated conveyance canal to carry water to the existing south Delta SWP and CVP facilities.

Both the movement of diverted freshwater around the Delta and improvements to operations exporting freshwater through the Delta (described as dual facilities operations) would provide the flexibility to operate the water export system such that the Delta ecosystem and covered fish species habitat can be greatly improved over existing conditions. Operations of the dual conveyance options would occur in tandem, with the new north Delta facilities operated preferentially over the south Delta facilities to maximize environmental benefits within the Delta. Dual operations of new and existing diversion facilities would significantly reduce present levels of entrainment of fish (particularly delta and longfin smelt) and invertebrates and the export of organic material and nutrients. Constructing state of the art positive barrier fish screens on in-river and on-river intakes along the Sacramento River and employing flexible operational scenarios would minimize fish mortality at the new north Delta diversion sites. The north Delta diversion facilities are an integral part of the conservation strategy that allow for covered fish species to gain maximum benefits from other conservation measures while meeting the water supply reliability goals of the BDCP. The flexibility associated with operation of dual facilities would allow habitat restoration to be implemented in the western, eastern, and south Delta because additional organic production generated from these restored habitats could pass through the interior Delta with reduced risk of entrainment at the south Delta facilities.

In addition to the ecological benefits, water supply reliability would be greater with the north Delta diversion and isolated facility because these facilities would be constructed to be more resilient to catastrophic events (e.g., levee breaching from earthquakes and floods) and sea level rise than the existing through-Delta conveyance. Further, there would be less need to maintain low salinity in the Delta for SWP and CVP exports, which could allow salinity regimes to fluctuate more freely and interact with the hydrodynamics in the west, south, and central Delta to provide more favorable conditions for covered fish species.

The conservation strategy includes a broad range of conservation measures that address a broad range of environmental stressors on covered species and natural communities, including:

1. Restoring physical habitat (including floodplain, freshwater and brackish tidal marsh, channel margin, and riparian habitat) to improve spawning, rearing, holding, and migration habitat and to increase nutrient and food availability for covered fish species and to restore and enhance habitat for covered wildlife and plant species;

2. Providing the freshwater necessary for fish survival, including the quantities and quality needed for habitat formation and maintenance;

3. Reducing the occurrence of toxic contaminants in Delta waterways to reduce direct and indirect effects on covered species;

4. Improving dissolved oxygen conditions, particularly in chronic sags, to improve fish passage and survival;

5. Preventing future introductions of non-native aquatic species, rapidly responding to new non-native aquatic species introductions with the purpose of eradicating

these species, and controlling existing populations of non-native aquatic species to reduce their adverse effects on covered fish species;

6. Improving the physical design and operations of non-Project diversions to reduce entrainment of covered fish species;
7. Increasing law enforcement capacity to reduce illegal harvest of covered fish species;
8. Managing the legal harvest of covered fish species and reducing illegal harvest of covered fish species;
9. Improving Central Valley hatchery management practices to minimized adverse effects on wild salmonid stocks;
10. Creating and expanding refugial population programs for specific covered fish species as a source for population enhancement and as a "safety-net" against extinction; and
11. Reducing the adverse effects of commercial and recreational activities on covered fish species.

These measures are highly interrelated with the operations of the north Delta diversion facilities and with each other, and their implementation as an integrated package is expected to produce synergistic benefits much greater in magnitude than could be achieved by their individual implementation. The north Delta diversion facilities would provide the flexibility to support flow patterns that may emulate natural processes more closely than the current through-Delta conveyance system and would enhance the function of restored tidal marsh habitat in the western, eastern, and southern Delta. Hydraulic residence time, and therefore productivity, in the interior Delta is expected to increase while unnatural reverse flows on Old and Middle rivers associated with fish entrainment would be reduced. Physical habitat restoration, in turn, has been shown to have potential beneficial affects on the hydrodynamics of the system by increasing tidal flows and dampening tidal range. Control and reduction of invasive species in Delta channels can reduce the risk of covered species to predation, allowing for lower flow rates (i.e., longer exposure of covered species to potential predators) that can allow greater operational flexibility. The reduction of toxic discharges, improvements to other water quality problems, and reduction of the effects of commercial and recreational activities would result in a healthier, more productive ecosystem, increasing the potential that covered fish species would successfully respond to operational and habitat restoration measures. Similarly, improved management of hatcheries and mark-select harvest programs can effectively limit adverse effects of hatchery raised fish on wild fish, increasing the potential for survival of covered fish species and their responsiveness to other conservation measures. Any one of the conservation measures alone has limited effectiveness. However, by implementing these measures together as an integrated package, the potential for success of the overall conservation strategy would be dramatically increased.

The break between near-term and long-term BDCP implementation periods is defined by the completion of the north Delta diversion and around-Delta conveyance facilities. A number of conservation measures cannot be implemented until the north Delta diversion is operable and therefore would be long-term actions only. Those measures that are not dependent on operations of the new facilities would be initiated in the near-term period.

The specific components of the conservation strategy are described below for different geographic regions of the Delta in the context of BDCP near-term and long-term implementation periods. Each section also describes the logic behind the proposed approach and how conservation measures addressing water operations, habitat restoration, and other stressors are integrated to maximize conservation effectiveness.

3.3.2 North Delta Conservation Measures

The primary components of the conservation strategy in the north Delta are to:

1. Construct and operate new screened diversion facilities on the Sacramento River connected to a canal to convey water around the Delta to the existing south Delta export facilities. Although located in the north Delta, the new diversion facilities are expected to have major influences on nearly all other conservation measures throughout the Delta (the benefits of these facilities for covered fish species and water supply are discussed in Section 3.3.1);
2. Modify Fremont Weir and improve the Yolo Bypass inundation regime to benefit covered fish species;
3. Restore tidal marsh habitat in the Cache Slough complex to improve food supply and habitat for covered fish species;
4. Improve the flow regime to better support natural processes;
5. Evaluate the direct and indirect effects of ammonia on covered species and, if deemed necessary to protect the covered species, reduce artificial ammonia inputs to the Delta.

A major component of the strategy in the north Delta is the modification and operation of Fremont Weir that would allow an improved inundation regime in the Yolo Bypass to benefit covered fish species. Recent research has suggested that covered fish species, particularly splittail and Chinook salmon, would significantly benefit from optimizing the frequency, duration, and timing of seasonal inundation of the Yolo Bypass (Sommer et al. 1997, 2001, 2004). Such inundation is expected to improve spawning and rearing conditions to allow increased growth and survival of individuals, improve migration by improving passage conditions, and export phytoplankton, zooplankton, and other organic material to Cache Slough, the lower Sacramento River, the western Delta, and Suisun Bay. This increase in food supply is expected to benefit delta and longfin smelt. This conservation measure is expected to provide enhanced productivity to the western Delta and Suisun Marsh.

Tidal marsh restoration in the Cache Slough complex is expected to provide significant benefit to covered fish species. In particular, the Cache Slough complex has been identified as a significant area for spawning and rearing of delta smelt and other pelagic species (Lund et al. 2008). Further, the area is thought to provide a major source of food and organic matter to covered fish species and the rest of the aquatic ecosystem in the lower Sacramento River, Delta, and Suisun Bay. The close tidal connection of the Cache Slough complex to the lower Sacramento River provides unimpaired migration of fish from the Delta and Sacramento River into an inundated Yolo Bypass. In addition, hydrodynamic modeling has demonstrated that increased tidal exchange in the Cache Slough area as a result of physical habitat restoration reduces or eliminates reverse flows in Steamboat and Sutter Sloughs and the mainstem Sacramento River, thus enhancing transport of fish and nutrients through these waterways and ameliorating lower flows that could result from north Delta exports (A. Munevar pers. comm.). Restored of tidal marshes would be designed to provide a more natural gradient of habitats comprised of a mosaic of tideflats, tidal channels, and patches of tules and other emergent vegetation transitioning into riparian and upland herbaceous vegetation that would provide habitat for covered wildlife and plant species. Restored tidal marsh would expand the extent of native habitat for giant garter snake, California black rail, and tricolored blackbird and adjacent riparian and upland herbaceous habitat would support flood refugia for marsh-associated wildlife and would provide nesting and foraging habitat for Swainson’s hawk. The range of conditions that would be present within restored marshes would also be expected to provide conditions suitable for the natural establishment of Suisun Marsh aster, Delta tule pea, Mason’s lilaeopsis, and Delta mudwort. This conservation measure is expected to provide enhanced aquatic productivity to the western Delta and Suisun Marsh. Implementation of this conservation measure is expected to begin in the near-term BDCP implementation period.

Improving flow regimes to better support natural processes (e.g., diverting more during wet periods and less during dry) of the Sacramento River is an important aspect of the conservation strategy in the North Delta. Essential parts of the life history of covered fish species, such as spawning, emigration, and immigration, are triggered by natural events, particularly hydrological patterns. Therefore, more natural hydrological conditions are thought to benefit multiple ecosystem processes and covered species, including improved anadromous fish passage, improved nutrient and food supply transport, and improved spawning conditions for delta smelt and longfin smelt. With the addition of new points of diversion in the north Delta, Delta operations can be more flexible, thus providing greater opportunity to better support more natural flow patterns. Changes in flow regimes would influence the western Delta and Suisun Marsh. Implementation of this conservation measure would be in the long-term BDCP implementation period once new north Delta diversion facilities are operational.

Another significant conservation measure in the north Delta involves identifying and reducing the possible effects that ammonia may have on covered fish species. The BDCP would work with the Sacramento Regional County Sanitation District and other dischargers to determine the direct and indirect effects of ammonia on covered fish species. If significant direct or indirect effects of ammonia on covered species are demonstrated and additional protection is needed, the BDCP would work with these dischargers to identify appropriate actions and identify funding sources to reduce loads in Delta waterways to levels below which adverse effects result. Results of recent preliminary water quality investigations suggest that ammonia directly (e.g., acute and chronic toxicity) and indirectly (e.g., adverse effects to macroinvertebrates, phytoplankton, and other species that reduce food availability) affects covered fish species in the Delta, but there remains considerable uncertainty regarding the extent of such effects. Although source control and discharge regulations are in effect for dischargers in the north Delta, opportunities may exist to further reduce ammonia loads entering the Delta. Reducing ammonia loads in the north Delta is predicted to reduce ammonia concentrations downstream in the western Delta and Suisun Marsh. If necessary, this conservation measure is expected to be implemented in the near-term.

Additional conservation measures in the north Delta, including altering the schedule of Delta Cross Channel operations and restoring channel margin and riparian habitat along major migration corridors and levees, such as Steamboat and Sutter Sloughs. Altering the Delta Cross channel schedule could improve conditions for covered species in the south Delta. Construction and operation of north Delta diversion facilities would facilitate the benefits of these actions due to a decreased need to open the Delta Cross Channel to maintain low salinity in the south Delta for project exports and lower risk of entrainment in the central Delta of fish that benefit from these north Delta conservation actions.

3.3.3 West Delta and Suisun Marsh Conservation Measures

Conservation measures in the west Delta and Suisun Marsh primarily revolve around providing high quality, low salinity habitat where it can best meet key fishery needs and minimizing entry of covered fish into the central Delta. The primary components of the conservation strategy in this geographic region include:

1. Restore tidal brackish marsh habitat in Suisun Marsh to provide rearing and foraging habitat for covered fish species;
2. Modify operation of the Montezuma Slough Salinity Control Structure to improve hydrodynamics in the west Delta, Suisun Marsh, and Suisun Bay and improve local movement ability of individual fish;
3. Evaluated benefits and, if supported, install gates on either side of Bacon Island to reduce the amount of saltwater that enters the Delta tidally and prevent entry of covered fish species into the interior Delta where mortality rates may be higher; and
4. Evaluated benefits and, if supported, install gates in Three Mile Slough to prevent entry of covered fish species into the interior Delta where mortality rates may be higher.

Suisun Marsh was historically characterized by a large tidal brackish water wetland with a network of dendritic channels, subtidal habitats, and intertidal habitats that supported a complex community of fish, wildlife, and plants. Much of this brackish marsh has been diked and managed as freshwater marsh, often to support waterfowl for hunting clubs. Under the conservation strategy, a portion of the existing diked wetland habitat would be restored as tidal brackish water wetland and dendritic tidal channels. Marsh channels provide juvenile rearing and adult foraging habitat for a diverse assemblage of resident and migratory fish, macroinvertebrates, plants, and wildlife. The marsh functions as an important source of nutrients, phytoplankton, and macroinvertebrates that can serve as food for covered fish species and other aquatic and terrestrial species inhabiting the western Delta and Suisun Marsh. Preliminary modeling efforts indicate that brackish marsh restoration in Suisun Marsh would result in changes to local and regional hydrodynamics extending upstream and downstream of Suisun Marsh. The location of the low salinity mixing zone is primarily influenced by interaction of Delta outflow and tides; restoration in Suisun Marsh, depending on the location, can influence salinity patterns upstream and downstream of the marsh.

Restored brackish tidal marsh would be designed to provide a more natural gradient of habitats comprised of a mosaic of tideflats, tidal channels, and patches of emergent vegetation transitioning into upland herbaceous vegetation that would provide habitat for covered wildlife and plant species. Restored brackish tidal marsh would enhance existing and expand the extent of native habitat for salt marsh harvest mouse, Suisun shrew, California black rail, California clapper rail, and tricolored blackbird. Where land surface elevations are suitable along the margins of Suisun Marsh, transitional herbaceous uplands would be maintained to provide flood refugia for marsh-associated wildlife. The range of conditions that would be present within restored marshes would also be expected to provide conditions suitable for the natural establishment of Suisun Marsh aster and soft bird's-beak.

Restoration of brackish tidal marsh in Suisun Marsh would reduce the need for freshwater diversions into these wetlands via the operation of the Montezuma Slough Salinity Control Structure. Existing operation of the salinity control structure alters the tidal hydrodynamics within Montezuma Slough and marsh, modifying current patterns and circulation of water within the marsh and Suisun Bay. Operation of the salinity control structure has also been identified as an impediment to migration of species such as adult Chinook salmon and may adversely affect local movement of other covered fish species. As a result, modifying the operation of the structure is expected to benefit covered species by restoring more natural hydrodynamics in the region and restoring more natural movement patterns of covered fish species. Restoration of brackish marsh in Suisun Marsh is predicted to alter salinity in the western Delta with the location of the marsh restoration in Suisun Marsh determining the relative benefits or drawbacks to aquatic habitat in the western Delta habitat. (J. DeGeorge, pers. comm.). Implementation of this conservation measure is expected to begin in the near-term.

Installation and operation of new gates at Three Mile Slough and on Connection Slough and Old River on the east and west sides of Bacon Island are expected to reduce the entry into the interior Delta of migrating Sacramento River fish, including larval and juvenile delta smelt, juvenile Chinook salmon, and juvenile steelhead. Such entry into the interior Delta would potentially expose these fish to direct and indirect effects associated with existing south Delta diversions, increased vulnerability to entrainment at a large number of unscreened water diversions throughout the interior Delta, increased vulnerability to predation mortality, increased exposure to seasonally elevated water temperatures, and other potentially adverse water quality conditions. Gates would be closed when covered fish and other aquatic species of interest were in the vicinity to keep fish from passing into the interior Delta. An additional benefit of gates at Bacon Island is the ability to manage seasonal salinity conditions within the central and southern regions of the Delta. The gates would be closed when covered fish species are in the vicinity of the western

Delta and during times of low water quality in the south Delta, such as during low flow periods.

Many of the conservation measures in the west Delta and Suisun Marsh would be implemented and provide benefits to species during the BDCP near-term implementation period. With long-term operations of the north Delta diversion facilities the benefits of gates at Three Mile Slough and Bacon Island would decline because the south Delta export facilities would not be required to operate as frequently or divert as high a flow. Although other diversions must be considered, the effects of entrainment in the south Delta would decline dramatically with the preferential operation of the north Delta diversions. Based on RMA modeling, tidal marsh restoration in Suisun Marsh could increase or decrease the salinity regime of the west Delta, depending on the restoration location within Suisun Marsh, thereby affecting the need for gates in the west Delta (J. DeGeorge pers. comm.).

Conservation measures in the west Delta would enhance the benefits provided by conservation measures in other Delta regions and conservation measures in other Delta regions would enhance benefits of those in the west Detla. Restoration of tidal marsh in the west Delta would increase connectivity between existing and restored habitats upstream in the Cache Slough area with existing and restored habitats located downstream in Suisun Marsh. Floodplain restoration in the Yolo Bypass and the south Delta and tidal marsh restoration in Cache Slough and the south Delta would provide inputs of nutrients, organic material, and plankton to the west Delta and Suisun Bay that benefit covered species inhabiting these areas. Reductions in ammonia loads from upstream sources are expected to benefit fish and other species in the west Delta and Suisun Marsh and Bay if ammonia is found to be a stressor on these species. Improving present seasonal wetland management practices in Suisun Marsh would increase dissolved oxygen and reduce methylmercury levels in surrounding aquatic habitat, providing enhanced conditions for covered fish and other aquatic species.

3.3.4 South Delta Conservation Measures

The conservation measures in the south Delta are primarily focused on reducing physical and biological effects of the south Delta SWP and CVP diversion facilities and improving habitat quality along major migration pathways for covered fish species.

The primary components of the conservation strategy in this geographic region include:

1. Restoring tidal marsh, floodplain, channel margin, riparian, shaded riverine, and transitional grassland habitat along the major migration corridors in the south Delta;
2. Improving water quality in the south Delta through increasing San Joaquin River inflows and reducing polluted agricultural and municipal discharges;
3. Managing SWP and CVP diversions (in tandem with the new north Delta diversions) to minimize reverse flows in Old and Middle rivers; and
4. Increasing dissolved oxygen levels in the Stockton Deep Water Ship Channel.

Handout #5

Construction and operation of north Delta diversion facilities and isolated conveyance canal would reduce the SWP and CVP dependence on south Delta diversions, which would reduce entrainment of covered fish, phytoplankton, zooplankton, and organic material at the south Delta facilities. Reduced reliance on diversions from the south Delta would provide opportunities to improve important covered fish species migration corridors by restoring channel margin and floodplain habitat in the south Delta. Entrainment of the increased phytoplankton, zooplankton, and other organic material derived from restored habitat in the south Delta and other regions would decline, allowing this productivity to be utilized in the west Delta and downstream bays.

Physical habitat restoration in the south Delta would include a mosaic of tidal marsh, floodplain, channel margin, riparian, and transitional grassland habitats along the major fish migration pathways: the San Joaquin River, Old River, and Middle River. Floodplain and channel margin habitat would be restored by setting back levees along these waterways to provide spawning and rearing habitat for covered fish species. Tidal marsh and floodplain habitat would be restored by breaching levees and raising subsided land surfaces, as practicable, at one or more of the following locations: Fabian Tract, Union Island, and Lower Roberts Island. These habitat restoration measures would be designed to provide spawning and rearing habitat locally and food for covered fish species in downstream habitats in the south and west Delta and Suisun Marsh and Bay.

Restored habitats would be designed to provide a more natural ecological gradient comprised of a mosaic of tide flats, tidal channels, and patches of tules and other emergent vegetation transitioning into riparian and upland herbaceous vegetation that would provide habitat for covered wildlife and plant species. Restored tidal marsh would expand the extent of native habitat for California black rail and tricolored blackbird and adjacent riparian and upland herbaceous habitat would support flood refugia for marsh-associated wildlife and would provide nesting and foraging habitat for Swainson's hawk. The range of conditions that would be present within restored marshes and channel margin habitats would also be expected to provide conditions suitable for the natural establishment of Suisun Marsh aster, Delta tule pea, Delta button celery, Mason's lilaeopsis, and Delta mudwort. Transitional upland habitat would provide accommodation space for future sea level rise resulting from climate change. Together, this mosaic of habitats would provide high habitat complexity to support a higher diversity of aquatic, wetland, and terrestrial species. Implementation of south Delta habitat restoration would occur in the long-term period, after the north Delta diversion facilities are operational, to minimize the entrainment at the south Delta export facilities of productivity derived from these restoration projects.

A number of conservation measures are aimed at reducing the inputs of toxic contaminants from agricultural, municipal, and urban run-off by working with existing programs such as the Irrigated Lands Regulatory Program, promoting integrated pest management, investigating the role of endocrine disruptors derived from urban sources, and working with cities in the Delta to implement actions from and in addition to their respective stormwater management plans. In addition to operating to a more natural hydrograph, increased San Joaquin River flows would be expected to reduce the residence time of toxics in the Delta and increase dissolved oxygen concentrations in the Stockton Deep Water Ship Channel. Low dissolved oxygen concentrations in the

Stockton Deep Water Ship Channel would be also addressed through a collaborative effort with the Army Corps of Engineers, the Port of Stockton, and the State Water Resources Control Board. Restoring riparian habitat along migration corridors would shade these waterways and would help maintain water temperatures below levels at which they adversely affect covered fish species and other aquatic organisms. Implementation of these conservation measures could be initiated in the near-term.

3.3.5 East Delta Conservation Measures

The conservation strategy in the east Delta is centered on restoring habitat along the elevation gradient near the eastern edge of the Planning Area. Because of its landscape position, the east Delta historically served as a transitional habitat from shallow subtidal to intertidal marsh to transitional riparian and grassland habitats. Consequently, the east Delta provided high habitat complexity that supported multiple ecosystems across a small geographical area. The conservation strategy would restore this hydrological and ecological gradient of different habitat types to maximize diversity while providing accommodation space for future sea level rise due to climate change. The restored habitats would be expected to improve food web processes, support splittail spawning and rearing habitat, and rearing habitat for salmonids from the San Joaquin River and tributaries.

For the same reasons described for the north and south Delta, restoration of a mosaic of habitats within the east Delta would be expected to enhance existing and expand the extent of habitat for the giant garter snake, California black rail, tricolored blackbird, Suisun Marsh aster, Delta tule pea, Mason’s lilaeopsis, and Delta mudwort.

Implementation of habitat restoration in the east Delta is expected to begin in the near-term, although, if the eastern levee of the isolated canal would be used as an edge to restoration area, the habitat restoration measure would rely on completion of his portion of the canal.

3.3.6 Delta-Wide Conservation Measures

A number of stressors that affect covered fish species throughout the Delta and Suisun Bay and Marsh would be addressed through conservation measures that are not specific to individual geographic regions. These stressors can directly and indirectly affect fish and can be temporally and spatially variable in their effects. Primary conservation measures implemented Delta-wide include:

1. Preventing the future introduction of, identifying and rapidly responding to new introductions of, and controlling existing populations of non-native species;
2. Reducing inputs of toxic contaminants into Delta waterways;
3. Improving hatchery practices to benefit wild-reared salmonids;
4. Supporting conservation hatcheries to create refuge populations of delta and longfin smelt;
5. Improving harvest practices to protect covered fish species from overfishing and illegal harvest;

6. Improving the design and operations of non-project diversions to reduce entrainment of covered fish species; and

7. Reducing the effects of recreational activities on specific sensitive habitat sites in the Delta.

There are multiple approaches by which the BDCP conservation strategy would address non-native species. The most cost-efficient and effective way to manage non-natives is to prevent their introduction and thereby avoid the extensive ecological damage caused by and the management costs of established non-native species populations (e.g., overbite clam, asiatic clam, Brazilian waterweed). The conservation strategy includes conservation measures that would improve the prevention of introductions of new non-natives via commercial and recreational vessels. Once non-natives enter the Delta, they may not immediately become widely established and rapid detection and response to such invasions could eradicate them before they become widespread. The conservation strategy includes conservation measures that improve with early detection and eradication of non-native species in early invasion stages. The BDCP would also implement conservation measures aimed at reducing the existing populations of two groups of non-natives thought to have large effects on the Delta ecosystem – predatory fish, including striped bass and centrarchids, and submerged and floating aquatic vegetation, including Brazilian waterweed and water hyacinth. In addition to these conservation measures, it is anticipated that restoration of habitat and hydrology in the Delta to more natural conditions would benefit native species to the detriment of non-natives, further “tipping the scale” in favor of native species. All of these conservation measures would be implemented in the near-term.

In addition to conservation measures that are specific to particular geographic regions (e.g., ammonia input at the Sacramento Regional County Sanitation District’s outfall on the Sacramento River), the BDCP conservation strategy would reduce loads of contaminants at point and non-point sources found throughout the Delta. Targeted sources of contaminants include urban runoff effluent, wastewater discharge, and agricultural return flows. The BDCP would work closely with the Central Valley Regional Water Quality Control Board to reduce methylmercury loads in Delta waterways in parallel with their TMDL program. The BDCP would also assist in the design and implementation of a real-time comprehensive monitoring program to provide rapid detection of and response to toxic contaminant events in the Delta that could affect covered fish species. Reducing toxic loads would improve the quality and quantity of spawning, rearing, and holding habitat for covered fish species. These conservation measures would be implemented in the near-term.

The BDCP conservation strategy includes conservation measures aimed at reducing the effects of hatcheries on wild salmonids in the Delta. Conservation measures include working with hatchery managers to assist in the development and implementation of hatchery and genetic management plans and providing 100% marking of hatchery reared fish in conjunction with implementation of a mark-select fishery. These actions would integrate with physical habitat restoration, hydrodynamic improvements, predator reduction, and water quality improvements to benefit wild salmonids. These conservation measures would be implemented in the near-term.

Handout #5

The BDCP conservation strategy includes funding of a conservation propagation program to enhance delta and longfin smelt populations. The program would use advanced techniques to minimize potential hatchery effects on wild fish stocks. As habitat is enhanced for these species through other conservation measures, it may be necessary to enhance wild-reared populations with fish produced by these hatcheries with the goal of returning populations to self sustaining levels. The propagation program would also serve as refugia should the wild populations be extirpated. This conservation measure would be implemented in the near-term.

The BDCP conservation strategy includes a conservation measures to reduce legal and illegal harvest of covered fish species by providing additional funding to the existing Delta-Bay Enhanced Enforcement Program and by proposing to the Fish and Game Commission the establishment of daily bag and size limits for splittail harvest. Both of these conservation measures would improve the likelihood that enhanced populations of covered species, resulting from improvements from other conservation measures in the conservation strategy, would survive and reproduce sufficiently. These conservation measures would be implemented in the near-term

Depending on the results of a comprehensive study to examine the effects of non-project diversions, a BDCP conservation measure would provide incentives to diverters who are willing to make operational and structural changes to their diversions to reduce entrainment of covered fish species. In addition to conservation measures that would improve harvest practices, this conservation measure would further improve the likelihood of survival and reproduction of enhanced populations of covered species supported by habitat quality and quantity enhancements. This conservation measure would be implemented in the near-term.

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Personal Communications

Handout #5

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Munevar, A. CH2M Hill. Presentation to the BDCP Conveyance Working Group on Hydrodynamic effects of Delta-wide tidal marsh restoration: initial evaluation. September 26, 2008.